

CLAIMS

1. A carbinol-functional silicone resin comprising the units:

$(R^1_3SiO_{1/2})_a$ (i)

$(R^2_2SiO_{2/2})_b$ (ii)

$(R^3SiO_{3/2})_c$ (iii) and

$(SiO_{4/2})_d$ (iv)

wherein R^1 and R^2 are each independently a hydrogen atom, an alkyl group having from 1 to 8 carbon atoms, an aryl group, a carbinol group free of aryl groups having at least 3 carbon atoms, or an aryl-containing carbinol group having at least 6 carbon atoms, R^3 is an alkyl group having from 1 to 8 carbon atoms or an aryl group, a has a value of less than or equal to 0.6, b has a value of zero or greater than zero, c has a value of greater than zero, d has a value of less than 0.5, and the value of $a + b + c + d = 1$, with the proviso that when each R^2 is methyl the value of b is less than 0.3 and with the proviso there is on average at least one carbinol group per resin molecule.

2. A carbinol-functional silicone resin of claim 1 wherein
the alkyl group is methyl;
the aryl group is phenyl;
the carbinol group free of aryl groups having at least 3 carbon atoms is selected from a group
having the formula R^4OH wherein R^4 is selected from

(1) a group having the formula $-(CH_2)_x-$ where x has a value of 3 to 10,

(2) $-CH_2CH(CH_3)-$,

(3) $-CH_2CH(CH_3)CH_2-$,

(4) $-CH_2CH_2CH(CH_2CH_3)CH_2CH_2CH_2-$, and

(5) a group having the formula $-OCH(CH_3)(CH_2)_x-$ wherein x has a value of 1 to 10

and a group having the formula $R^6(OH)$ wherein R^6 is a group having the formula -

$CH_2CH_2(CH_2)_xOCH_2CH-$ wherein x in each case has a value of 1 to 10;

the aryl-containing carbinol group having at least 6 carbon atoms is a group having the formula R^5OH wherein R^5 is selected from

- (1) a group having the formula $-(CH_2)_xC_6H_4-$ wherein x has a value of 0 to 10,
- (2) a group having the formula $-CH_2CH(CH_3)(CH_2)_xC_6H_4-$ wherein x has a value of 0 to 10, and
- (3) a group having the formula $-(CH_2)_xC_6H_4(CH_2)_x-$ wherein x has a value of 1 to 10.

3. A carbinol-functional silicone resin comprising the units:

$(R^1_3SiO_{1/2})_a$ (i)

$(R^2_2SiO_{2/2})_b$ (ii)

$(R^3SiO_{3/2})_c$ (iii) and

$(SiO_{4/2})_d$ (iv)

wherein R^1 is independently a hydrogen atom, an alkyl group having from 1 to 8 carbon atoms, an aryl group, a carbinol group free of aryl groups having at least 6 carbon atoms, or an aryl-containing carbinol group having at least 6 carbon atoms, R^2 is a hydrogen atom, an alkyl group having from 1 to 8 carbon atoms, an aryl group, a carbinol group free of aryl groups having at least 3 carbon atoms, or an aryl-containing carbinol group having at least 6 carbon atoms, R^3 is an alkyl group having from 1 to 8 carbon atoms or an aryl group, a has a value of less than or equal to 0.6, b has a value of zero or greater than zero, c has a value of greater than zero, d has a value of less than 0.5, and the value of $a + b + c + d = 1$, and with the proviso that when each R^2 is methyl the value of b is less than 0.3 and with the proviso that greater than 25 wt% of the $R^1+R^2+R^3$ groups in the carbinol-functional silicone resin are phenyl.

4. The carbinol-functional silicone resin of any of Claims 1 to 3 where a has a typical value of 0.1 to 0.6, b has a typical value of 0 to 0.4, c has a typical value of 0.3 to 0.8, and d has a typical value of 0 to 0.3.

5. The carbinol-functional silicone resin according to Claim 1 or 2 wherein the carbinol-functional silicone resin is selected from carbinol-functional silicone resins comprising the units:

$((CH_3)_3SiO_{1/2})_a$

$((R^2)CH_3SiO_{2/2})_b$ where $R^2 = -(CH_2)_3C_6H_4OH$

$((C_6H_5)CH_3SiO_{2/2})_b$ and

$(C_6H_5SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((R^1)(CH_3)_2SiO_{1/2})_a$ where $R^1 = -(CH_2)_3C_6H_4OH$ and

$(C_6H_5SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((R^1)(CH_3)_2SiO_{1/2})_a$ where $R^1 = -(CH_2)_3C_6H_4OH$ and

$(CH_3SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((R^1)(CH_3)_2SiO_{1/2})_a$ where $R^1 = -(CH_2)_3OH$ and

$(C_6H_5SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((R^1)(CH_3)_2SiO_{1/2})_a$ where $R^1 = -(CH_2)_3OH$

$(CH_3SiO_{3/2})_c$ and

$(C_6H_5SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((CH_3)_3SiO_{1/2})_a$

$((R^2)CH_3SiO_{2/2})_b$ where $R^2 = -(CH_2)_3OH$

$((C_6H_5)CH_3SiO_{2/2})_b$ and

$(C_6H_5SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((CH_3)_3SiO_{1/2})_a$

$((R^1)(CH_3)_2SiO_{1/2})_a$ where $R^1 = -(CH_2)_3OH$ and

$(C_6H_5SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((R^1)(CH_3)_2SiO_{1/2})_a$ where $R^1 = -CH_2CH(CH_3)CH_2OH$

$((H)(CH_3)_2SiO_{1/2})_a$ and

$(C_6H_5SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((R^1)(CH_3)_2SiO_{1/2})_a$ where $R^1 = -(CH_2)_3OH$

$(CH_3SiO_{3/2})_c$

wherein a has a typical value of 0.1 to 0.6, b has a typical value of zero to 0.4, and c has a typical value of 0.3 to 0.8.

5. The carbinol-functional silicone resin according to any of Claims 1, 2 or 4, wherein greater than 10 weight percent of the $R^1+R^2+R^3$ groups are phenyl.

6. A method of preparing carbinol-functional silicone resins comprising reacting:

(A') at least one hydrogen-functional silicone resin comprising the units:

$(R^7_3SiO_{1/2})_a$ (i)

$(R^8_2SiO_{2/2})_b$ (ii)

$(R^3SiO_{3/2})_c$ (iii) and

$(SiO_{4/2})_d$ (iv)

wherein R^7 and R^8 are each independently an alkyl group having from 1 to 8 carbon atoms, an aryl group, or a hydrogen atom, R^3 is an alkyl group having from 1 to 8 carbon atoms or an aryl group, a has a value of less than or equal to 0.6, b has a value of zero or greater than zero, c has a value of greater than zero, d has a value of less than 0.5, the value of $a + b + c + d = 1$, with the proviso that when each R^8 is methyl the value of b is less than 0.3, with the proviso that there are at least two silicon-bonded hydrogen atoms present in the silicone resin; and (B') at least one vinyl-terminated alcohol; in the presence of (C') a hydrosilylation catalyst; and optionally (D') at least one solvent.

7. A method of preparing carbinol-functional silicone resins comprising reacting:

(A') at least one hydrogen-functional silicone resin comprising the units:

$(R^7_3SiO_{1/2})_a$ (i)

$(R^8_2SiO_{2/2})_b$ (ii)

$(R^3SiO_{3/2})_c$ (iii) and

$(SiO_{4/2})_d$ (iv)

wherein R^7 and R^8 are each independently an alkyl group having from 1 to 8 carbon atoms, an aryl group, or a hydrogen atom, R^3 is an alkyl group having from 1 to 8 carbon atoms or an aryl group, a has a value of less than or equal to 0.6, b has a value of zero or greater than zero, c has a value of greater than zero, d has a value of less than 0.5, the value of $a + b + c + d = 1$, with the proviso that when each R^8 is methyl the value of b is less than 0.3, with the proviso that there are at least two silicon-bonded hydrogen atoms present in the silicone resin and with the proviso that greater than 30 wt% of the $R^1+R^2+R^3$ groups phenyl; and (B') at least one vinyl-terminated alcohol; in the presence of (C') a hydrosilylation catalyst; and optionally (D') at least one solvent.

8. The method of preparing carbinol-functional silicone resins according to Claim 6 or 7 where a has a typical value of 0.1 to 0.6, b has a typical value of 0 to 0.4, c has a typical value of 0.3 to 0.8, and d has a typical value of 0 to 0.3.

9. The method of preparing carbinol-functional silicone resins according to Claim 6 where the hydrogen-functional silicone resins of (A) are selected from hydrogen-functional silicone resins comprising the units:

$((CH_3)_3SiO_{1/2})_a$

$((H)CH_3SiO_{2/2})_b$

$((C_6H_5)CH_3SiO_{2/2})_b$ and

$(C_6H_5SiO_{3/2})_c$

hydrogen-functional silicone resins comprising the units:

$((H)(CH_3)_2SiO_{1/2})_a$

$(C_6H_5SiO_{3/2})_c$,

hydrogen-functional silicone resins comprising the units:

$((H)(CH_3)_2SiO_{1/2})_a$

$(CH_3SiO_{3/2})_c$,

hydrogen-functional silicone resins comprising the units:

$((H)(CH_3)_2SiO_{1/2})_a$

$(CH_3SiO_{3/2})_c$ and

$(C_6H_5SiO_{3/2})_c$,

and

hydrogen-functional silicone resins comprising the units:

$((CH_3)_3SiO_{1/2})_a$

$((H)(CH_3)_2SiO_{1/2})_a$

$(C_6H_5SiO_{3/2})_c$

wherein a has a typical value of 0.1 to 0.6, b has a typical value of 0 to 0.4, and c has a typical value of 0.3 to 0.8.

10. An emulsion composition comprising: (A) a carbinol-functional silicone resin comprising the units:

$(R^1_3SiO_{1/2})_a$ (i)

$(R^2_2SiO_{2/2})_b$ (ii)

$(R^3SiO_{3/2})_c$ (iii) and

$(SiO_{4/2})_d$ (iv)

wherein R^1 and R^2 are each independently a hydrogen atom, an alkyl group having from 1 to 8 carbon atoms, an aryl group, a carbinol group free of aryl groups having at least 3 carbon atoms, or an aryl-containing carbinol group having at least 6 carbon atoms, R^3 is an alkyl group having from 1 to 8 carbon atoms or an aryl group, a has a value of less than or equal to 0.6, b has a value of zero or greater than zero, c has a value of greater than zero, d has a value of less than 0.5, and the value of $a + b + c + d = 1$, and with the proviso that when each R^2 is

methyl the value of b is less than 0.3, and with the proviso there is on average at least one carbinol group per resin molecule; (B) at least one surfactant; and (C) water.

11. The emulsion composition according to claim 10 wherein the alkyl group is methyl; the aryl group is phenyl; the carbinol group free of aryl groups having at least 3 carbon atoms is selected from a group having the formula R^4OH wherein R^4 is selected from

- (1) a group having the formula $-(CH_2)_x-$ where x has a value of 3 to 10,
- (2) $-CH_2CH(CH_3)-$,
- (3) $-CH_2CH(CH_3)CH_2-$,
- (4) $-CH_2CH_2CH(CH_2CH_3)CH_2CH_2CH_2-$, and
- (5) a group having the formula $-OCH(CH_3)(CH_2)_x-$ wherein x has a value of 1 to 10 and a group having the formula $R^6(OH)$ wherein R^6 is a group having the formula $-CH_2CH_2(CH_2)_xOCH_2CH-$ wherein x in each case has a value of 1 to 10; the aryl-containing carbinol group having at least 6 carbon atoms is a group having the formula R^5OH wherein R^5 is selected from
- (4) a group having the formula $-(CH_2)_xC_6H_4-$ wherein x has a value of 0 to 10,
- (5) a group having the formula $-CH_2CH(CH_3)(CH_2)_xC_6H_4-$ wherein x has a value of 0 to 10, and

a group having the formula $-(CH_2)_xC_6H_4(CH_2)_x-$ wherein x has a value of 1 to 10.

12. The emulsion composition according to Claim 10 or 11 wherein where a has a typical value of 0.1 to 0.6, b has a typical value of 0 to 0.4, c has a typical value of 0.3 to 0.8, and d has a typical value of 0 to 0.3.

13. The emulsion composition according to Claim 10 or 11 wherein the carbinol-functional silicone resin is selected from carbinol-functional silicone resins comprising the units:
 $((CH_3)_3SiO_{1/2})_a$

$((R^2)CH_3SiO_{2/2})_b$ where $R^2 = -(CH_2)_3C_6H_4OH$

$((C_6H_5)CH_3SiO_{2/2})_b$ and

$(C_6H_5SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((R^1)(CH_3)_2SiO_{1/2})_a$ where $R^1 = -(CH_2)_3C_6H_4OH$ and

$(C_6H_5SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((R^1)(CH_3)_2SiO_{1/2})_a$ where $R^1 = -(CH_2)_3C_6H_4OH$ and

$(CH_3SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((R^1)(CH_3)_2SiO_{1/2})_a$ where $R^1 = -(CH_2)_3OH$ and

$(C_6H_5SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((R^1)(CH_3)_2SiO_{1/2})_a$ where $R^1 = -(CH_2)_3OH$

$(CH_3SiO_{3/2})_c$ and

$(C_6H_5SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((CH_3)_3SiO_{1/2})_a$

$((R^2)CH_3SiO_{2/2})_b$ where $R^2 = -(CH_2)_3OH$

$((C_6H_5)CH_3SiO_{2/2})_b$ and

$(C_6H_5SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((CH_3)_3SiO_{1/2})_a$

$((R^1)(CH_3)_2SiO_{1/2})_a$ where $R^1 = -(CH_2)_3OH$ and

$(C_6H_5SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((R^1)(CH_3)_2SiO_{1/2})_a$ where $R^1 = -CH_2CH(CH_3)CH_2OH$

$((H)(CH_3)_2SiO_{1/2})_a$ and

$(C_6H_5SiO_{3/2})_c$,

carbinol-functional silicone resins comprising the units:

$((R^1)(CH_3)_2SiO_{1/2})_a$ where $R^1 = -(CH_2)_3OH$

$(CH_3SiO_{3/2})_c$

wherein a has a typical value of 0.1 to 0.6, b has a typical value of zero to 0.4, and c has a typical value of 0.3 to 0.8.

14. The emulsion composition according to any of Claims 10 to 13, wherein greater than 10 weight percent of the $R^1+R^2+R^3$ groups are phenyl.

15. The emulsion composition according to any of Claims 10 to 14 wherein the emulsion composition further comprises at least one ingredient selected from fragrances, preservatives, vitamins, ceramides, amino-acid derivatives, liposomes, polyols, botanicals, conditioning agents, glycols, vitamin A, vitamin C, vitamin E, Pro-Vitamin B5, sunscreen agents, humectants, preservatives, emollients, occlusive agents, esters, pigments, and self-tanning agents.